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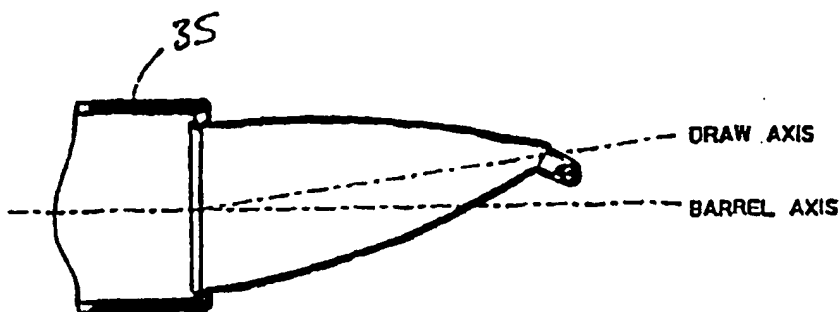


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(54) Title: MARKING INSTRUMENTS

3.ASSEMBLE THE SUB ASSEMBLY INTO BARREL THEREBY CREATING THE OFFSET.



(57) Abstract

A marking instrument comprises a marking tip (2) carried at the end of a tubular member (1) surrounding a channel for conducting marking fluid to the tip (2), wherein the tip has a tubular rear end section (3) joined to the tubular member so that the tip is fixed at an angle to the longitudinal axis of the tubular member, and at a connection plane where the tip and tubular member are joined, the tubular member and tubular section have complementary profiles of substantially the same shape. Preferably the complementary profiles are circular in shape at the connection plane, which precludes the necessity to rotationally orientate the components when bringing them together to be joined.

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MARKING INSTRUMENTS

This invention relates to the field of marking instruments, especially, but not necessarily exclusively, writing instruments, in which a marking
5 fluid is delivered to a marking tip from a reservoir.

Many writing instruments have marking tips which project axially out of the barrel of the instrument in which the reservoir chamber is housed and by means of which the writing instrument is held in the
10 hand in use. Furthermore, many marking tips, such as ball point pens, have tips which function most effectively if the tip is held substantially perpendicular to the surface being written on, but the majority of writers hold writing instruments inclined
15 at an angle to the paper, typically at about 30° away from perpendicular. It has been proposed to angle the marking tip to the main axis of the writing instrument in order to obtain a better orientation of the tip to the paper, but a satisfactory tip construction suitable
20 for manufacture on a production scale has so far eluded those who have attempted to produce such writing tips.

The present invention provides a simple and economic solution to the above problem and in accordance with the invention there is provided a
25 marking instrument comprising a marking tip carried at the end of a tubular member surrounding a channel for conducting marking fluid to the tip, wherein the tip has a tubular rear end section joined to the tubular member, so that the tip is fixed at an angle to a

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longitudinal axis of the tubular member, and at a connection plane where the tip and tubular member are joined, the tubular member and tubular section have complementary profiles of substantially the same shape.

5 Preferably the complementary profiles are circular in shape at the connection plane, which precludes the necessity to rotationally orientate the components when bringing them together to be joined. The tubular member may be tube of constant cross-
10 section. In one preferred construction a tube of elliptical cross-section is used. The tubular section of the tip is preferably circular in cross-section, which simplifies the tip construction, particularly in the case of a ball point tip in which a spherical ball
15 is retained. The tubular member can be made from a hollow component initially formed, such as by deep drawing, with a part-spherical end. Removal of a section of the part spherical end along a plane
20 inclined to the longitudinal axis leaves an edge of circular profile for attachment of the tip. The hollow component may have a substantially cylindrical shape, or can vary in cross-section along its length if desired.

 As the point at which the tip engages a
25 surface is offset from the longitudinal axis of the tubular member, in use, forces can be experienced tending to rotate the tubular member. Conveniently rotation of the tubular member is resisted by engaging a non-circular portion of this member, e.g. an end of
30 an elliptical tube or a flange with a non-circular periphery, in a socket of complementary cross-section formed in a body of the instrument. In the case of a ball point pen, for example, the body could be the forward end of the pen barrel, or it could be the body
35 of a refill which is fitted replaceably into the pen barrel.

The tip and tubular member can be fixedly joined by any suitable technique, but laser welding has been found particularly effective and efficient.

A full understanding will be gained from the following detailed description of some preferred embodiments, reference being made to the accompanying drawings in which:

Figure 1 is a transverse cross-section through a tube component utilised in a marking tip according to the invention;

Figure 2 is an axial section through the tube component taken on the line x-x in Figure 1;

Figure 3 shows the tube profile at the forward end face;

Figure 4 shows the tube component and a ball point tip being assembled together;

Figure 5 is a forward end view of the tip;

Figure 6 is an axial cross section through the joined tip and tube and illustrating assembly with a body part;

Figure 7 is a side elevation of the tip and tube joined and welded together;

Figure 8 is an axial section through a deep drawn hollow component used in the manufacture of a marking tip in accordance with the invention;

Figure 9 is a rear end elevation of the component shown in Figure 8;

Figures 10 and 11 are views corresponding to Figures 8 and 9, respectively, showing the hollow component after removal of a section from the closed end thereof;

Figures 12 and 13 are an axial section and rear elevation, respectively, of a complete marking tip assembly with a ball point tip attached to the hollow component;

Figure 14 is a side elevation of an alternative deep drawn hollow component;

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Figure 15 is a plan of the component of Figure 14;

Figure 16 is a front elevation of the hollow component;

5 Figure 17 is a cross-section taken along the line C-C of Figure 14;

Figure 18 is a side elevation of the component of Figure 14 after removal of a section from the closed end thereof;

10 Figure 19 is a longitudinal section through the component of Figure 18 with a ball point tip fixed thereto;

Figure 20 is a front elevation of the tip assembly of Figure 19;

15 Figure 21 is a front end elevation of another deep drawn component;

Figure 22 is an axial section through the deep drawn component of Figure 21;

20 Figure 23 shows in front elevation the component of Figures 21 and 22 after removal of the end section ready for attachment of the ball point tip;

Figure 24 is an axial section through the component after attachment of the ball point tip; and

25 Figure 25 shows the finished marking tip assembled with a pen body.

Illustrated in Figs. 1-3 is a tubular member of a marking instrument, this member being a tube 1, the transverse cross-section of which is a 30° ellipse. The forward end of this tube is cut so that the end face lies in a plane at 60° to the tube axis and the profile of the end face is circular. The marking tip 2, a ball point writing tip as shown in the exemplary embodiment at least a tubular rear section 3 which is cylindrical and has an end face with a circular profile
30 complementary to that of the end of the tube 1. The complementary circular profiles mean the tube and tip
35 can be easily brought together with their respective

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end faces in abutment ready for welding, as no rotational alignment is required. The tip and tube are fastened securely together in the assembled condition by laser welding, their abutting end faces defining a connection plane which is angled so that the tip 2 extends at 30° to the axis of the tube. As the point at which the ball 5 of the tip will contact the paper in use of the pen is offset, there is a tendency for the forces exerted on the tip to rotate the tube. To prevent such rotation occurring, the tube is inserted into a socket 10 of complementary elliptical cross-section formed in a body 12. The body can cover the tube over most of its length down to the welded joint with the tip, or it could even extend beyond this joint if required.

It is not essential to use a 30° ellipse for the tube cross-section and other sections can be used if different tip angles are required. For a writing instrument, however, a tip angle in the range of 25° to 35° is likely to be appropriate for most users. Also, there are other ways to bring the end face profiles of the tube and tip to match at the connection plane, e.g. by making the rear end section of the tip elliptical and cutting it at an angle, but this is likely to complicate manufacture of the tip component, especially if it incorporates a spherical ball. Furthermore the tip rear section and tube could both be cylindrical and have their end faces cut at the same angles so that complementary elliptical end faces are obtained, but this would require the components to be accurately rotationally aligned before being welded.

Although the tubular member to which the tip is joined is referred to as a tube, it can include additional features, such as an external flange which could key with the pen body to help resist rotation of the marking tip.

Figures 8 to 13 show an alternative

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embodiment of the invention in which the ball point tip 2 is laser welded to a tubular member in the form of a hollow component 21 initially shaped by deep drawing. As illustrated in Figs. 8 and 9, the component 21 is

5 deep drawn to include a cylindrical part 22 of circular cross-section closed at the forward end by a part-spherical, in particular substantially hemispherical, end wall 23. An external flange 24 is provided at the open rear end of the component 21, and the flange has a

10 non-circular periphery, due to a flat edge portion 25, for orientation of the component in the forward end of a pen body and for keying the component against rotation relative to the pen body. The deep drawn component 21 has a section of the part-spherical end

15 wall removed, such as by grinding along a plane at 60° to the component axis, as depicted in Figures 10 and 11, thereby to form an opening 26 surrounded by a circular edge of diameter substantially equal to that of the tubular rear section 3 of the tip 2. The rear

20 section of the tip is welded to this circular edge so that the tip 2 is fixed to the component 21 with its axis at 30° to the component axis as shown in Figs. 13 and 14. It is not essential that the forward end of the deep drawn component is closed and it could be

25 broken through during the deep drawing process, always provided that the end wall which is formed is sufficient to enable it to be ground to form an annular edge to match the rear end of the tubular section 3 of the tip 2.

30 By using deep drawing to form an initial hollow component in production of the tubular member, various shapes for that member are possible. Figures 14 to 20 for example illustrate an embodiment in which the component is tapered and shaped to replicate the

35 appearance of a conventional fountain pen. The component is shaped in the deep drawing process to have a flat upper surface portion extending along the part

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22 of the component between the flanged rear end and the part-spherical wall 23 at the front end. This part includes a short cylindrical section 27 adjacent the flange 24 followed by a tapering section 28 at which
5 the cross-section is essentially circular, and a further tapering section 29 at which the cross-section has the shape of a triangle with rounded vertices. Thus, the taper of the hollow member is asymmetrical so that the front end portion of the component has a
10 longitudinal axis offset from that of the rear end, and the flat surface has a smooth transition with the part-spherical end wall. A section of the end wall is ground away in a plane at 60° to the longitudinal axis and a ball point tip 2 is laser welded to the circular
15 edge provided by the grinding process, as described in relation to the embodiment of Figures 8 to 13, to provide a writing point of similar shape to a conventional fountain pen but having a ball point tip.

Figures 21 to 25 show another embodiment in which a hollow component 30 is formed by deep drawing. To facilitate the deep drawing process the component has a cross-section which reduces gradually along the axis of draw. For purposes which will be explained below the rear end of the component is formed with an
25 external peripheral flange 31 which lies in a plane inclined at an angle of 5 to 10° , e.g. around 8° to a plane perpendicular to the draw axis. The flange includes a flat 32 for rotational orientation purposes. The component 30 is formed at the leading end with a
30 part spherical end wall and as in the previous embodiments a section of this end wall is removed by grinding to define a circular edge 33, in this case in a plane at an angle of about 50° to the longitudinal axis, for attachment of the ball point tip 2 by laser
35 welding. The completed marking tip is assembled in a pen body 35 as illustrated in Figure 25, with the flange 31 concentric with the axis of the body and in a

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plane perpendicular to that axis. As a consequence, the axis of the deep drawn tip component 30 is inclined to the longitudinal axis of the pen body and the extreme point of the tip, i.e. the surface of the ball which contacts the paper during writing, is located a positioned space above the axis of the pen body, which has been found to be desirable in a writing instrument with an angled tip. The flat section 32 of the flange 31 keys with the pen body to prevent rotation of the marking tip relative to the pen body. There are, of course, other ways to ensure the angled orientation of the marking tip with respect to the axis of the writing instrument.

With a writing instrument embodying the invention it can be assured that the tip will be substantially perpendicular to the paper when in use. This means the rim of the tip surrounding the ball is more easily kept clear of the paper, and allows a small ball capable of drawing finer lines to be used.

While it is apparent that modifications and changes can be made within the spirit and scope of the present invention, it is our intention, however, only to be limited by the appended claims.

C L A I M S

1. A marking instrument comprising a marking tip carried at the end of a tubular member surrounding a channel for conducting marking fluid to the tip,
5 wherein the tip has a tubular rear end section joined to the tubular member so that the tip is fixed at an angle to the longitudinal axis of the tubular member, and at a connection plane where the tip and tubular member are joined, the tubular member and tubular
10 section have complementary profiles of substantially the same shape.
2. A marking instrument according to claim 1, wherein the profiles are circular in shape at the connection plane.
- 15 3. A marking instrument according to claim 1 or 2, wherein the tubular member is a tube of elliptical cross-section, and the tubular section of the tip is circular in cross-section.
4. A marking instrument according to claim 3,
20 wherein a portion of the elliptical tube is engaged in a socket of complementary cross-section formed in a body of the instrument.
5. A marking instrument according to claim 1 or 2, wherein the tubular member comprises a hollow
25 component shaped by deep drawing.
6. A marking instrument according to claim 1, 2 or 5, wherein the tubular member comprises a hollow component formed with a part-spherical end wall, and a section of said end wall is removed to define said
30 connection plane.
7. A marking instrument according to claim 5 or 6, wherein the hollow component has an external flange at the rear end thereof, and said flange has a non-circular periphery.
- 35 8. A marking instrument according to claim 5, 6 or 7, wherein the hollow component is substantially cylindrical between the ends thereof.

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9. A marking instrument according to claim 5, 6 or 7, wherein the hollow component tapers from the rear end towards the forward end thereof.
10. A marking instrument according to claim 9,
5 wherein the hollow member tapers asymmetrically, the longitudinal axis at the forward end being offset from the longitudinal axis at rear end.
11. A marking instrument according to claim 10,
10 wherein the hollow member is shaped to replicate the appearance of the writing point of a conventional fountain pen.
12. A marking instrument according to claim 5, 6, 7 or 9, wherein the tubular component is so attached to a body of the marking instrument that the axis of the
15 tubular component is inclined to the longitudinal axis of the body, and the extreme point of the tip is spaced from the axis of the body.
13. A marking instrument according to claim 12,
20 wherein the tubular component is formed with a rear end in a plane inclined to the axis of the tubular component.
14. A marking instrument according to any one of claims 1 to 13, wherein the tip is fixed to the tubular member by welding.
- 25 15. A marking instrument according to any one of claims 1 to 14, wherein the tip is a ball point tip.

FIG.1

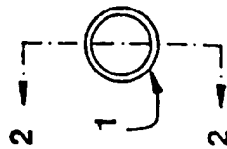


FIG.2

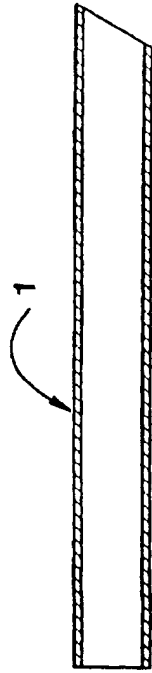


FIG.3



FIG.4

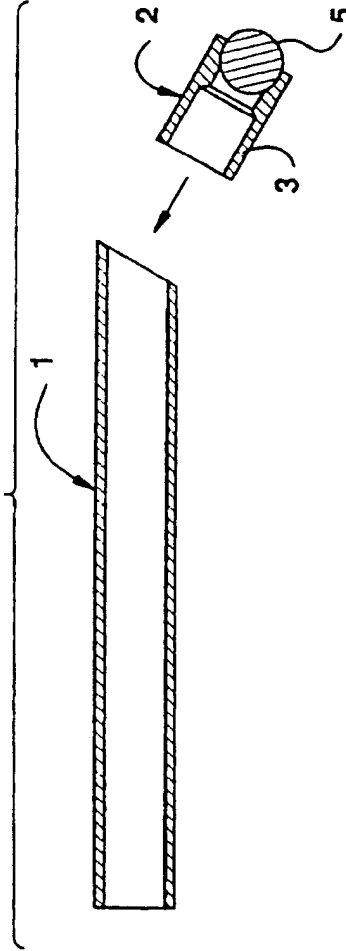


FIG.6

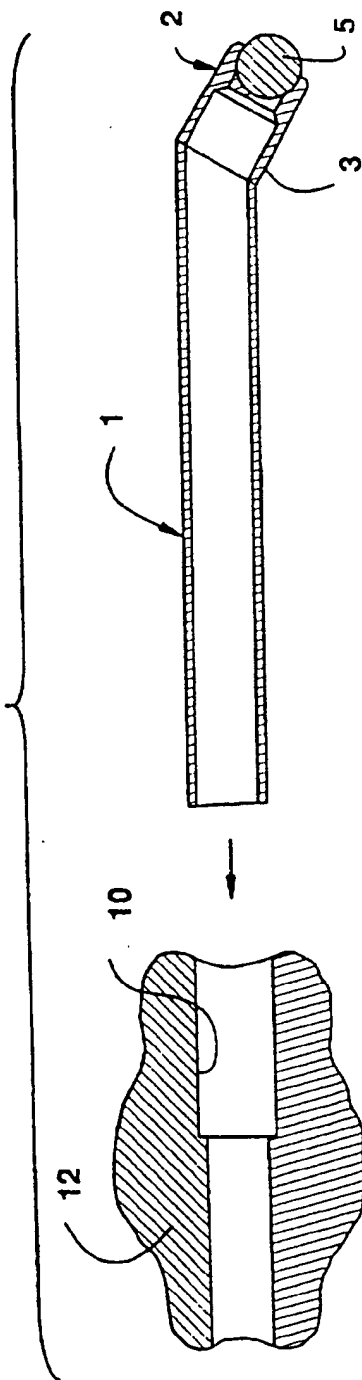


FIG.5



FIG.7

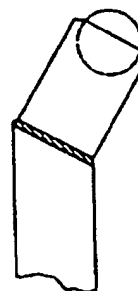


FIG.8

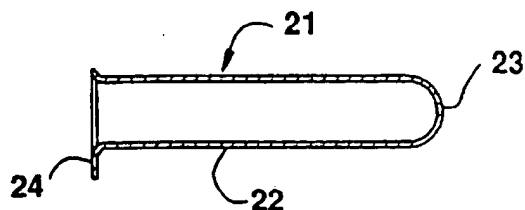


FIG.9

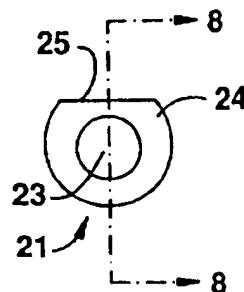


FIG.10

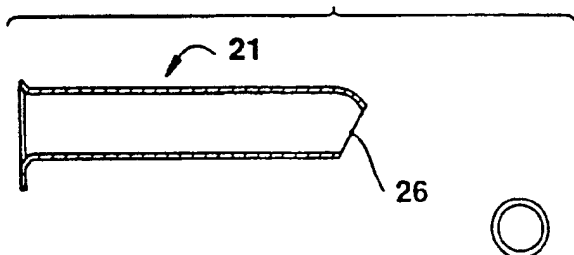


FIG.11

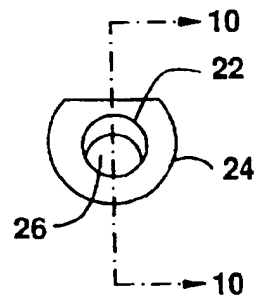


FIG.12

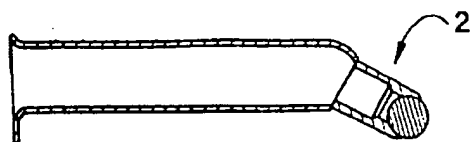


FIG.13

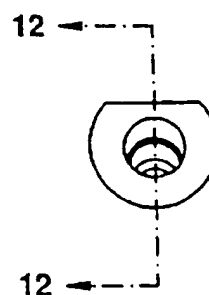


FIG.14

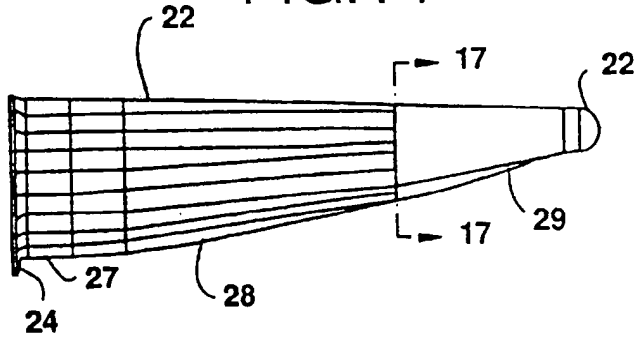


FIG.17

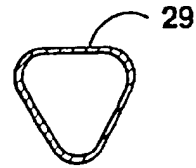


FIG.15

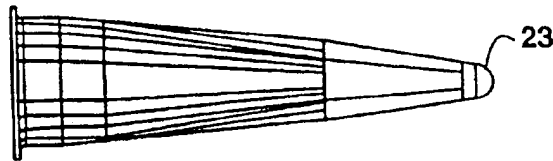


FIG.16

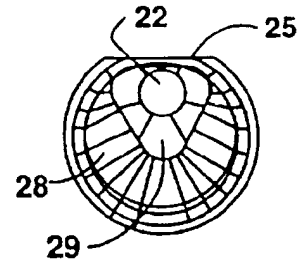


FIG.18

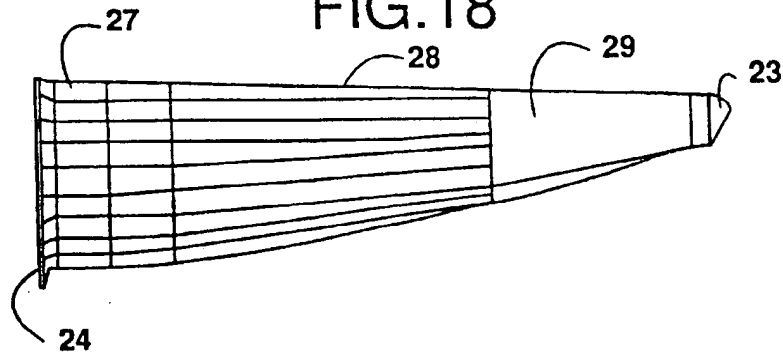


FIG.19

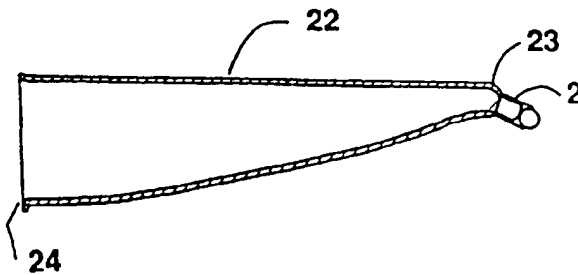


FIG.20

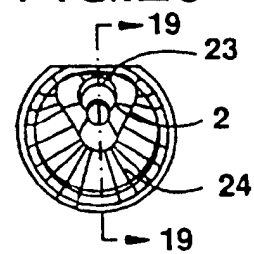


FIG.21

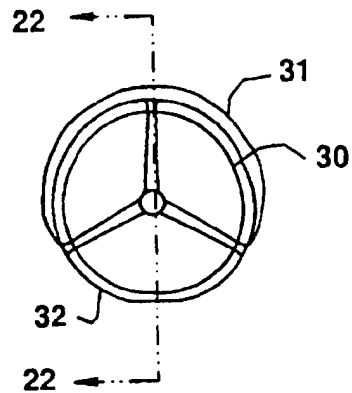


FIG.22

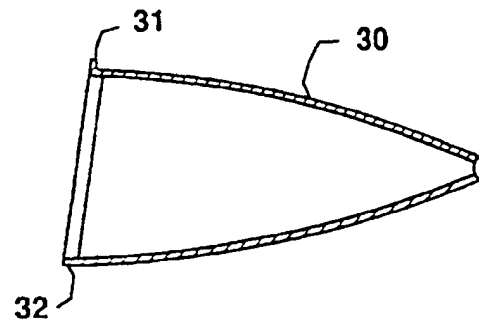


FIG.23

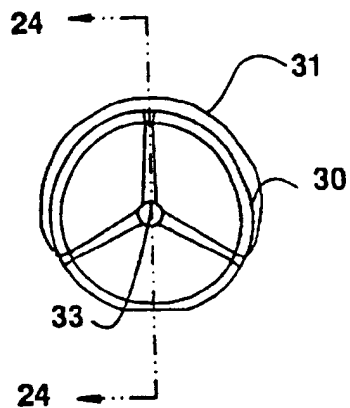


FIG.24

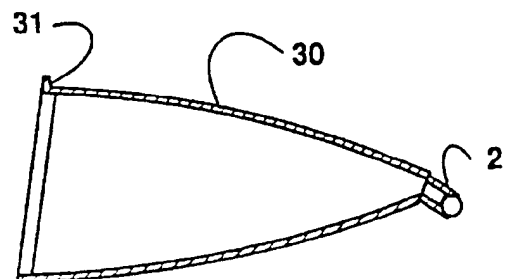
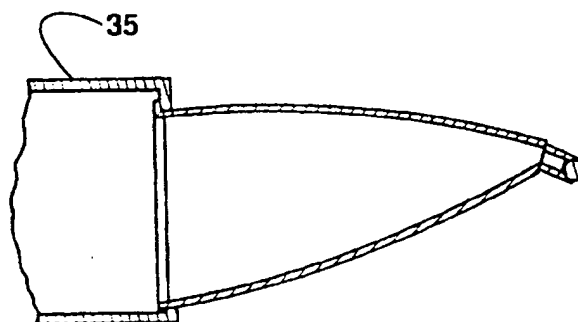


FIG.25



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/US 96/19883

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B43K7/00 B43K23/004

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B43K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 458 917 A (I.R.C. LIMITED) 18 November 1966 see page 5, paragraph 3; figures 7,8 see page 6, paragraph 3 - page 7, paragraph 2; figures 17-26 ---	1,2,5,8, 9,12,15
X	FR 1 032 122 A (FLICHER) 30 June 1953 see page 1, left-hand column, paragraph 1 - page 2, left-hand column, paragraph 3; figures ---	1,2,15
X	EP 0 170 426 A (MINNESOTA MINING AND MANUFACTURING COMPANY) 5 February 1986 see page 2, line 29 - page 7, line 14; figures ---	1,2,15
A	FR 1 585 676 A (LAUDICINI) 30 January 1970 see page 1, line 1 - line 33; figures ---	1,2,15
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Date of the actual completion of the international search

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Date of mailing of the international search report

28.05.97

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International Application No.
PCT/US 96/19883

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 592 406 A (FALTIN) 8 April 1952 see page - ---	1
A	FR 2 255 187 A (ROTRING-WERKE) 18 July 1975 see page 4, line 19 - line 41; figures 2,3 ---	5
A	DE 12 93 650 B (JOHMANN) 24 April 1969 see figures ---	1
A	DE 879 811 C (UHU-WERK) 15 June 1953 see figures 1,2 ---	1
A	WO 91 16210 A (KOLARIC) 31 October 1991 see abstract; figures ---	1
A	WO 91 14521 A (THE GILLETTE COMPANY) 3 October 1991 see abstract; figures -----	1